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PINE BUTTERFLY¹ IN
SOUTHERN IDAHO
1893-1984

By

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ABSTRACT

This report compiles information from a series of references in a chronological manner. One can see where defoliation by pine butterfly occurred repeatedly in the past and summarizes suppression efforts. This information will be useful in planning future land management activities.

INTRODUCTION

Once, a specimen of the pine butterfly was a butterfly collector's prize (Aldrich 1922). After an 1868 discovery in ponderosa pine stands throughout Oregon, Idaho, Washington, and British Columbia, this butterfly was identified and named by William H. Edwards. Upon further investigation, Edwards found it to be the only species of its genus on this continent, other varieties being on the islands of the Malay Archipelago. This led to the hypothesis that the eggs or larvae were first imported through a Pacific seaport (Shellworth 1922). Prior to an 1882 outbreak near Spokane, Washington (Evenden 1922a, Shellworth 1922), ponderosa pine trees denuded by swarms of this insect were

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generally unknown -- or, at least, unrecorded. However, pine defoliation over several hundred acres created its notorious reputation. Besides attacking ponderosa pine, Pinus ponderosa Laws., the pine butterfly has been reported in western white pine, Pinus monticola Dougl., lodgepole pine, Pinus contorta Dougl., and Douglas-fir, Pseudotsuga menziesii (Mirb.) Franco.

At low population levels pine butterfly larvae prefer to feed on old needles; only when pressured for food by crowding will they attack new growth. Although a tree could be totally defoliated in a single year, three years of repeated attacks are considered necessary to actually risk tree mortality from pine butterfly defoliation alone. However, the butterfly-weakened ponderosa pine can subsequently be attacked by other agents as bark beetles and root diseases. Additionally such factors as growth and aesthetics are greatly affected. The trend has been to encounter short outbreaks with severe defoliation of old and new growth, followed by western pine beetle (Dendroctonus brevicornis LeConte) infestation and reduced potential growth (Anonymous 1953d). Light defoliation is not detectable by aerial survey and must therefore be confirmed by ground survey. Chemical control has been effectively used, through application of DDT in fuel oil.

Information in this report was compiled from unpublished and published reports, and correspondence files in the Boise Field Office, Forest Pest Management, Boise, Idaho.

LIFE HISTORY AND HABITS

Pine butterflies overwinter as eggs, which are laid in single rows on the current year's needles. Viable eggs are emerald green and usually hatch in late May; however, humid spring conditions can delay emergence. First instar larvae are pale green with black heads and are about 0.1 inch in length. Five instars are passed before larvae reach maturity near the end of July, at which time they are approximately 1 inch long, pubescent, and dark green with 2 white lateral stripes. Most defoliation results from later instars during the last 7 - 10 days of the larval development. Anticipating pupation, larvae may migrate to bark crevices and limbs, stay on twigs, or lower themselves by a silken thread to the ground vegetation. Female pupae are dark brown and are usually found in bark crevices or under loose plates on pine trunks. Male pupae are generally yellow-green and are more frequently found on twigs or on vegetation below (Cole 1956b).

Adult pine butterflies emerge from August to early October, with the peak flight in mid-August. They closely resemble the cabbage butterfly, Pieris rapae (Linn.), in appearance. Wing span is about 1-3/4 inches; head and body are black above, white beneath, and pubescent. The white wings display black tip markings which are more pronounced in the female. Female wings are also yellow-tinged and some have orange spots on the hind apical margin. Adults mate soon after emergence, and eggs are deposited a few hours thereafter. There is one generation per year. Although females prefer to lay eggs near the top of the trees, they will deposit over the entire crown in an outbreak. Mature to overmature trees are favored -- particularly those on ridge-tops.

Natural Control: Parasites

Of the four major enemies of the pine butterfly, two attack the eggs: a pentatomid stink bug, Podisus placidus (Uhler), and snakeflies, Raphidia spp.. The others -- the sarcophagid fly, Agria affinis (Fall) and the ichneumonid wasp, Theronia atalantae fulvescens (Cresson) -- attack the pupae (Cole 1956a, Valcarce 1972). Of these four, T. atalantae is usually given credit for natural control of outbreak populations. However, at least 2 seasons of defoliation pass before natural enemy populations reach sufficient numbers to effect control (Evenden 1927). Between 1896 and 1898, T. atalantae increased rapidly following increased pine butterfly populations in northern Idaho and throughout the Pacific Northwest; in 1898 it seemed as though every caterpillar was attacked. This ended the outbreak so thoroughly that no pine butterflies were seen in the infestation area for 5 years, and only a few could be found each summer for another 5-10 years (Aldrich 1922).

It is interesting to note that Shellworth (1922) attributed the irregular intervals between pine butterfly outbreaks to an increase in a fungus fatal to Ichneumonidae (family of T. atalantae). Butterfly outbreaks seemed to occur in years with conditions favorable for the fungus, which appears as a gray-white "powder" on wasps' bodies. With fewer natural enemies, more caterpillars reach adulthood and lay eggs.

Related Problems

The pine butterfly alone does not often kill trees but, in conjunction with other agents defoliation may result in tree mortality. For example, Evenden (1926) indicated that for trees within the pine butterfly infestation area, many more dead trees had a needlecast disease plus butterflies than had died from butterflies alone.

The primary mortality agent for butterfly-weakened trees is bark beetles, which cut galleries between the bark and the sapwood, eventually girdling the tree. In the 1922 Arling infestation, beetles were more important in tree losses than the pine butterfly alone (Evenden 1922b).

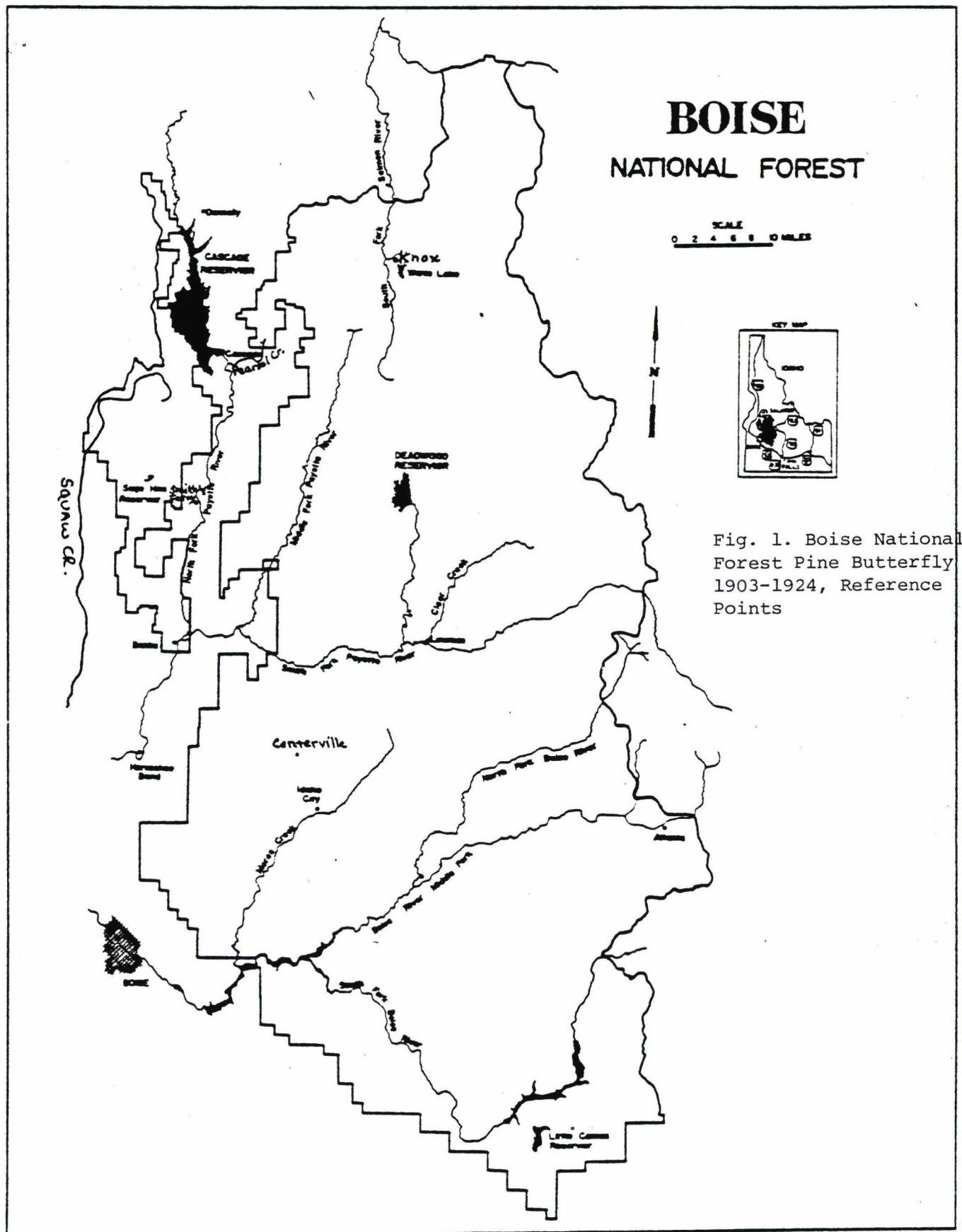
HISTORY OF OUTBREAKS

1893 & 1898

Pines in the Payette and Boise River watersheds were heavily defoliated in 1893. According to an old settler, the hanging larvae forced people from huckleberry patches and all water sources had to be skimmed before one could drink from them. Ponderosa pine in southern Idaho was again infested during 1898, with streams and pools being covered with the dead adults as before (Shellworth 1922).

1903-1908

Recurrence of pine butterfly in southern Idaho during 1903-1904 was compounded by bark beetle outbreaks at Smith's Ferry, Clear Creek, and Centerville in 1905 and 1906 (Fig. 1). These three areas are all within the boundaries of main sheep trails, which stressed trees further due to the passage of sixty thousand sheep twice a year for forty years. Exposure of



roots, trampling, erosion, and sun scalding of bark contributed to susceptibility to beetle attack (Shellworth 1922). This butterfly epidemic finally subsided in 1908, principally through the action of a parasitic fly (presumed to be A. affinis) (Mains 1922).

1920-1924

Several severe infestations erupted during this period (Figs. 1,2). The Salmon River district was first to report its outbreak in 1920 (Shellworth 1922). From 1921 to 1923, the Payette Lake area and the Little Salmon and Payette River headwaters in central Idaho, Payette National Forest, suffered severe defoliation over 27,000 acres with approximately 25% stand mortality (Anonymous 1953d, Cole 1956b). In 1922, the Middle Fork of the Payette River, Boise National Forest, had evidence of the pine butterfly on every watershed investigated. In addition to attack of ponderosa pine, higher elevations experienced injury to Engelmann spruce, lodgepole pine, and to a lesser degree, Douglas-fir. Bark beetle attacks, including western pine beetle and others, were more numerous than in previous years (Shellworth 1922). Heaviest butterfly infestations occurred at Meadows, McCall, Sphinx, Arling, and Clear Creek, where old growth was consumed and new, 1922, growth damaged (Evenden 1922b). Ponderosa pine around Silver Creek Ranger Station was heavily defoliated, with some measure of damage to all trees over an extensive area (Bunch 1922).

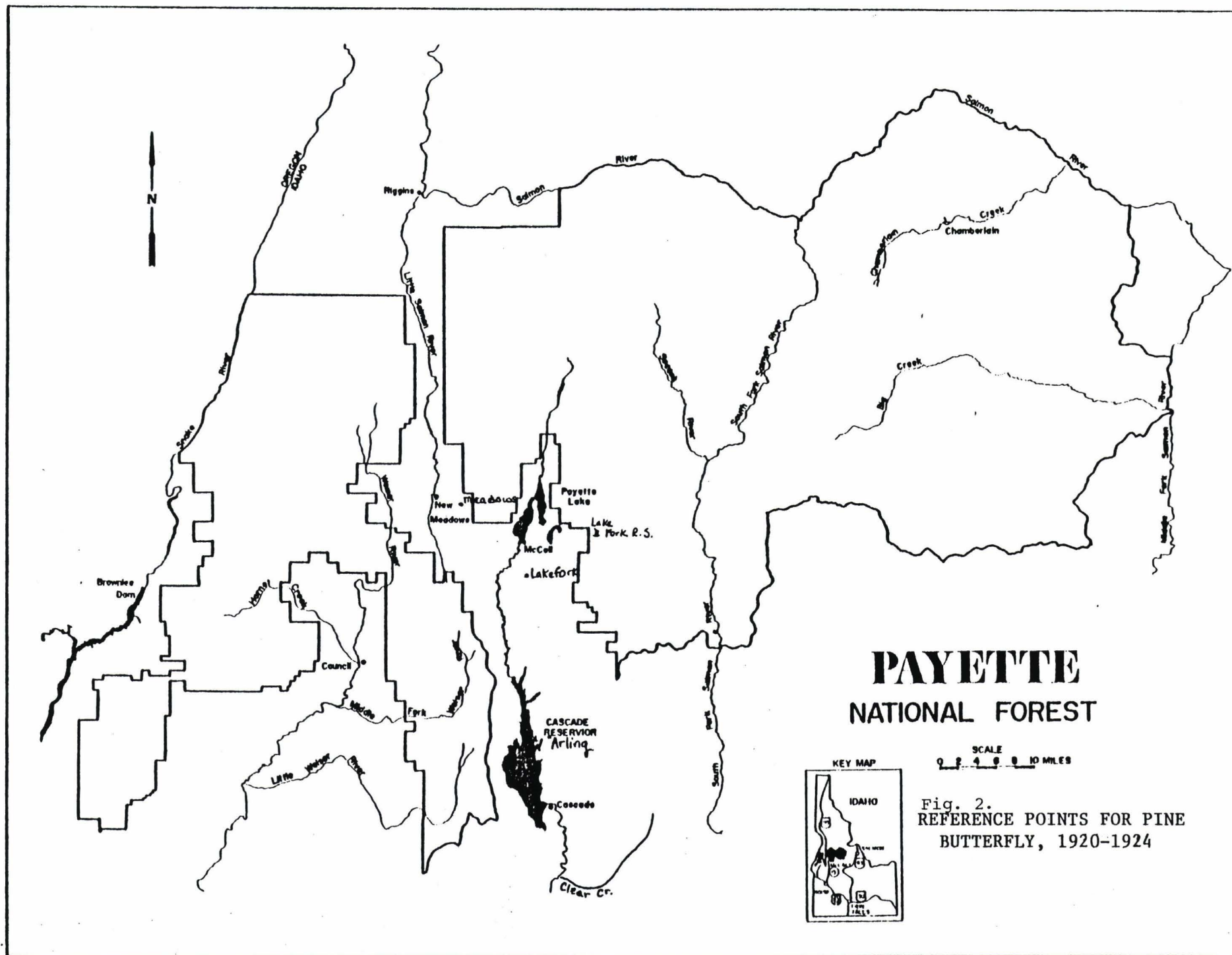
Severe defoliation continued in 1923. Reports of heavy infestations arrived from Salmon, Meadows, and Lake Fork tracts, as well as along Squaw Creek and the Middle and North Forks of the Payette River (Miles 1923). Varying degrees of ponderosa pine defoliation occurred along the Weiser and Little Salmon Rivers (Shellworth 1922). On Pearsol Creek, trees from Cascade to Knox appeared dead, having been defoliated for the second consecutive year. Butterflies south of Smith's Ferry were thought to have migrated from the Pearsol area in search of available needles on which to lay eggs (Miles 1923). The Payette National Forest, at least, reported heavy parasitism, with less severe defoliation than in 1922 (Evenden 1923, Miles 1923). Infestations seemed to peak in August of 1923.

Very few caterpillars were detected in 1924 and good recovery was reported at some sites, including areas north of New Meadows and the Sphinx area south of McCall. Other stands were not as promising; west of McCall, a needle fungus, Elytroderma (Hypoderma) deformans (Weir) Darker, further defoliated the trees. Overmature stands also did not rapidly refoliate (Evenden 1927).

1940-1952

In the annual insect report of 1940, small numbers of pine butterfly were reported in ponderosa pine stands around High Valley, Shirts Creek, and the Second Fork of Squaw Creek on the Boise National Forest (Wilde 1940) (Fig. 3). In the 1943 report, ponderosa pine in the Squaw Creek drainage again hosted some pine butterflies (Van Meter 1943). Observations reported on the Boise National Forest were less numerous in 1947 than in 1946 (Farrell 1947) and only small numbers were reported there in 1948 and 1949. Idaho City Ranger District noted adult butterflies in ponderosa pine stands in the Clear Creek and Macks Creek drainage in 1949 (Farrell 1948, 1949).

A widespread outbreak began in 1950 on the Boise National Forest with butterflies appearing mostly on high ridges between Deadwood Reservoir and the Middle Fork of the Boise River (Cole 1956b). Butterflies were found



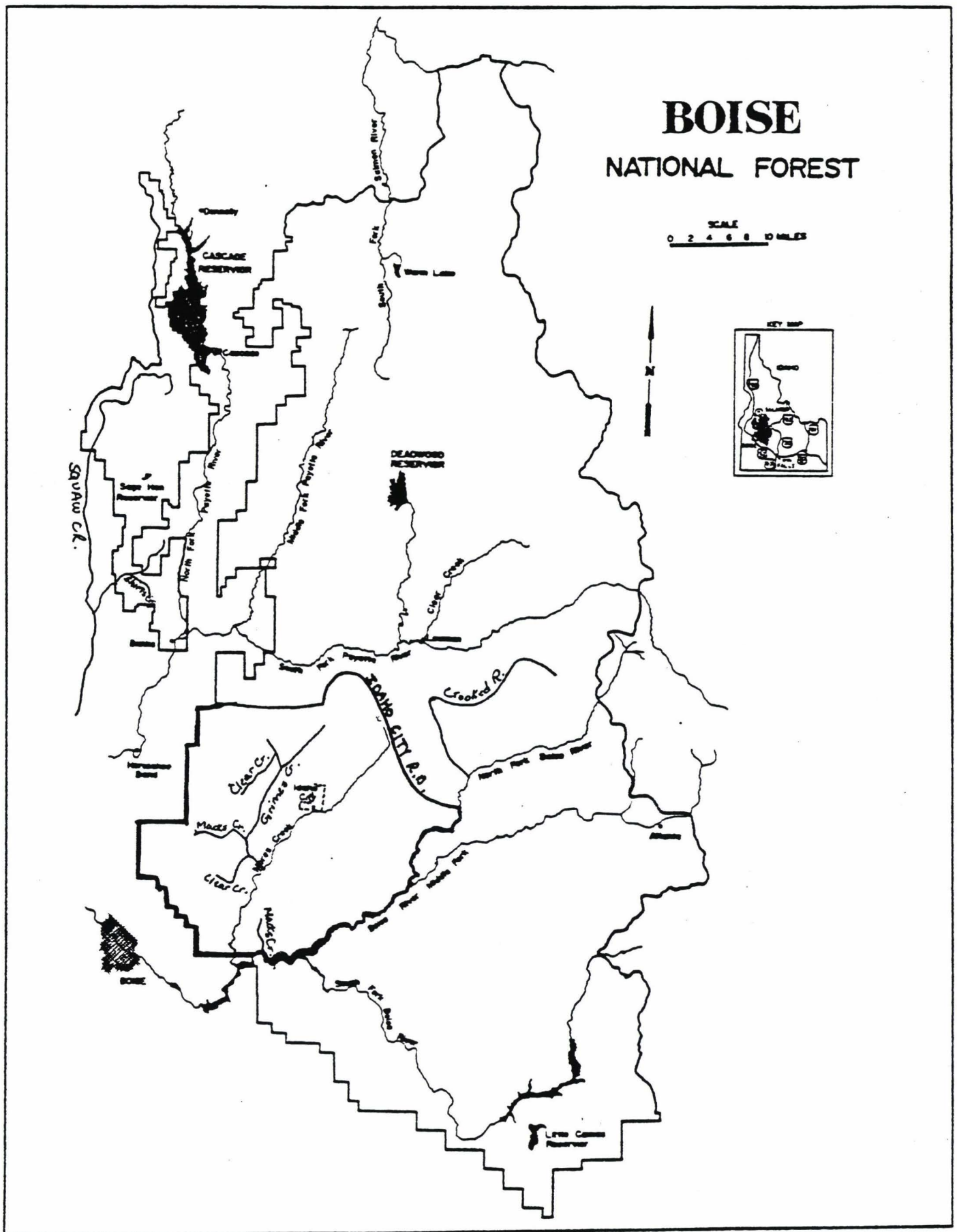


Fig.3. REFERENCE POINTS FOR PINE BUTTERFLY, 1940-1952

throughout the Forest though the situation was not serious at this point and No heavy defoliation resulted. The outbreak intensified in 1951, when pine butterfly populations were three to four times that of previous years (Doupe 1951). Population increases were also noticed along Crooked River and other areas (Orr 1952b, 1953a) with no observed defoliation (Doupe 1952). As the pine butterfly populations continued to increase on the Boise and Payette National Forests in 1951, the infestation area was slated for careful observation the following year. Close observation and reporting was advocated to determine the need for suppression in 1953 (Orr 1952a, 1953a).

1953

The severity and extent of the pine butterfly defoliation in many of Idaho's best ponderosa pine stands was of considerable concern to affected land managers. Summer reports from Boise, Valley, and Elmore counties tallied close to 1.6 billion board feet in the infestation area, threatening a half billion dollars' worth of damage to timber, jobs, watershed, recreation, and wildlife (Anonymous 1954a). One outbreak occurred in the area south and east of Lowman, between the South Fork of the Payette River and the Middle Fork of the Boise River, Boise National Forest (Anonymous 1953a) (Fig. 4). Sightings along Brush Creek in the Crouch territory, in the Deadwood area, and north of Grouse Creek near the Sawtooths added to the list (Robb 1953). The Swanholm drainage (Middle Fork of the Boise River) had as much as 50% defoliation on some stands; Owl Creek Summit area also suffered heavy defoliation (Doupe 1953). The South Fork of the Payette River exhibited a dense butterfly concentration in the lower part of the Warm Springs drainage (Flock 1953b). On the Boise National Forest, severe defoliation encompassed approximately 6000 - 8000 acres in 8 areas, mostly on high ridges. Some trees suffered more than 90% defoliation of old and new needles (Anonymous 1953b, 1953c).

August aerial detection surveys over the Boise National Forest showed 130,000 acres infested (Olsen 1953d). Lower Lowman District, formerly District 5, reported a "pretty heavy concentration" around Clear Creek (Flock 1953a). Other areas of severe defoliation occurred on Eight Mile Creek, Owl Creek, and Crooked River, and aerial survey disclosed pine defoliation in the Beaver Creek and Bear Creek areas (Fickes 1953, Olsen 1953a). The Beaver Creek site, about 20 miles east of Idaho City, was chosen for an experimental spray project.

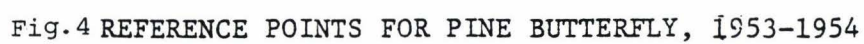
An egg mass survey conducted in September and October identified 39,000 acres of infestation (Robb 1953), bringing the total of high-value timber stands infested by pine butterfly to 169,000 acres (Anonymous 1953d). Hope for natural control by parasites and predators dwindled as the situation intensified.

1954

The infestation on the Boise National Forest peaked in 1954 and plans were made for a full-scale aerial suppression project that summer. Between 1952 and 1954, an estimated 255,400 acres had been infested by the pine butterfly. From the 169,000 acres reported for 1954, four major areas were delineated as follows (Anonymous 1953d):

- 1) Beaver Creek, Swanholm -- 108,000 acres
- 2) Clear Creek, South Fork Payette -- 36,000 acres
- 3) Deadwood River -- 21,000 acres
- 4) Pine Creek -- 4,000 acres

SCALE
0 2 4 6 8 10 MILES



1957-1958

No reference to pine butterfly was made in annual reports until 1957, when only small, localized infestations appeared. A spot infestation of approximately 2,700 acres occurred between Smithy Creek and Nezperce Creek on the Salmon National Forest (Cole and Mineau 1957a) (Fig. 5). "Continued vigilance" on the Payette, Salmon, and Boise National Forests was recommended. In 1958, two districts on the Salmon National Forest noticed populations. North Fork District, reported light defoliation over 52,000 acres from Carmen Creek to Gibbons Pass, with lesser amounts observed at Hull and Hughes Creeks. Indianola District, noted low populations of adult pine butterflies at Colson and Spring Creeks and around Dutchler Mountain (Cole and Mineau 1958). The Hull Creek population was rated "endemic", as was one at Dahlonga Creek, where a high T. atalantae population existed. Colson Creek and Spring Creek were rated "moderate". It was not believed that these few localized populations indicated a full-scale outbreak (Cole 1958a).

A study on tree mortality and increment growth loss from pine butterfly defoliation was released in 1958. Of 300 trees evaluated in 1953 on the Boise National Forest, twelve were cut, classified by extent of damage to old needles, and analyzed in 1958. All trees exhibited a severe reduction in growth in 1953 and 1954 (Cole 1958b).

1959-1960

In 1959, a second study was conducted to determine the effects of defoliation five years following suppression. Results showed a highly significant difference in mean annual growth between the periods 1940-1952, when there was little butterfly defoliation, and 1952-1959, during a butterfly outbreak. Reductions resulting from pine butterfly defoliation indicated growth was 39.34% of normal. Tree mortality in the 1950's was far less than had resulted from the 1920's outbreak, when no chemical control was used (Cole 1966).

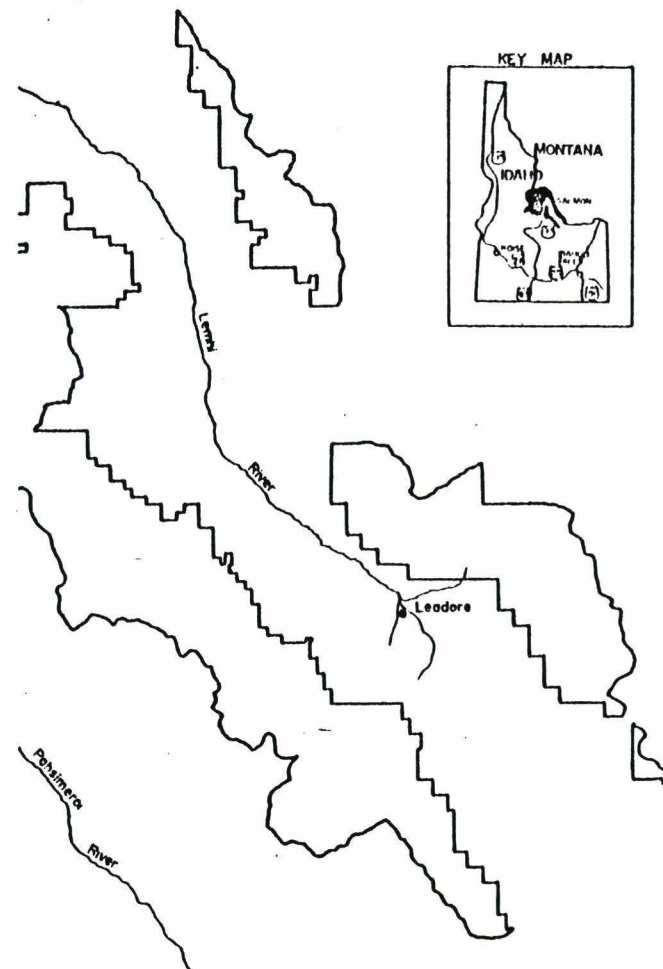
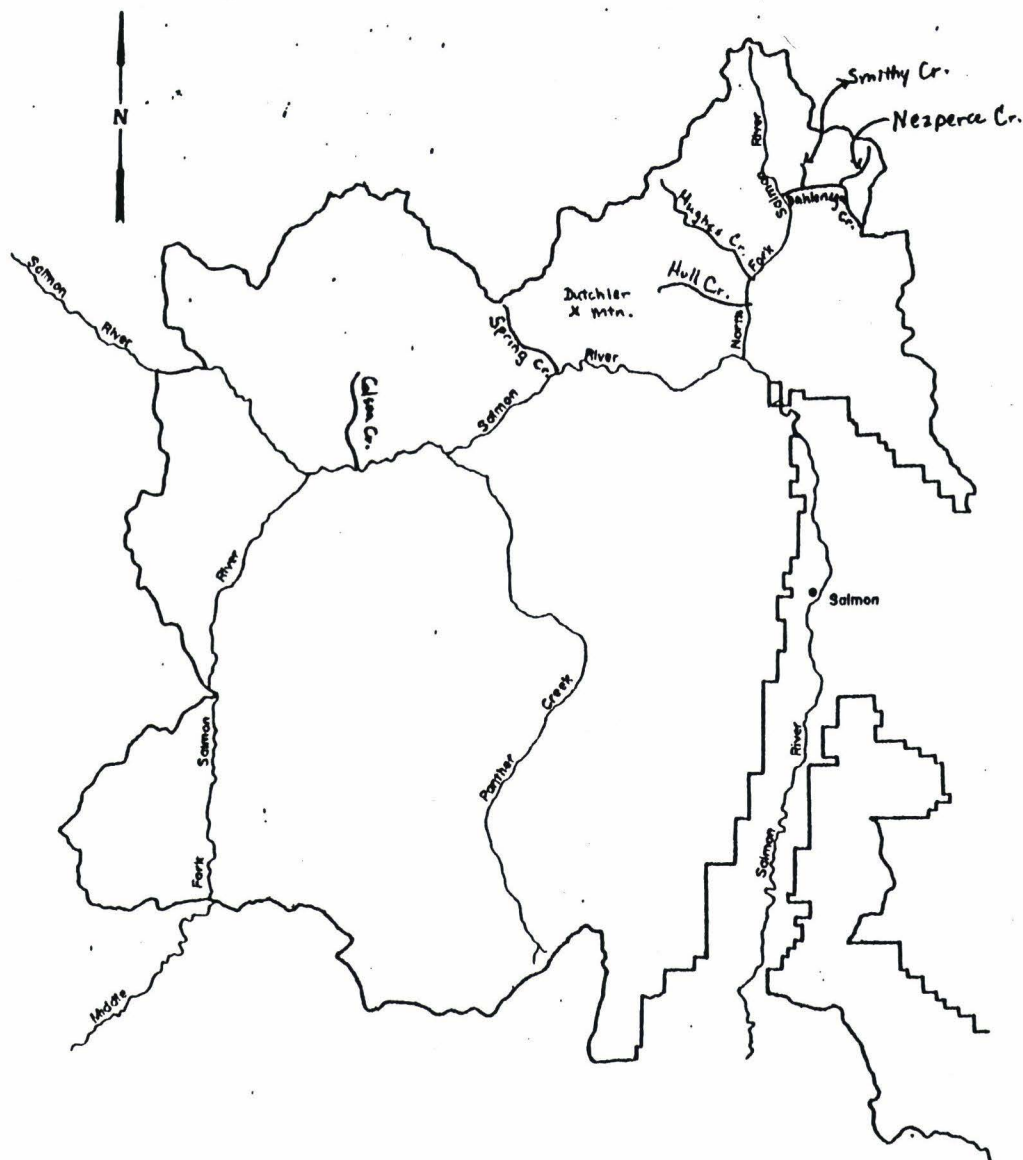
In 1960, the pine butterfly was mentioned as an important insect on ponderosa and white pine in the Intermountain Region, although details were not given (Fortenberry 1960).

1968-1970

Large flights of adult butterflies were observed on the Boise and Payette National Forests, although no defoliation was noticed (Parker and Tegethoff 1971). Increased populations in 1970 threatened visible defoliation to ponderosa pine in 1971.

1971

Light, scattered defoliation, detectable only from the ground, was observed on the Boise and Payette National Forests in 1971. However, large flights of adult butterflies, which had been building for 3 years on many areas of the Forests, gave cause for concern (Parker et al. 1971). Light defoliation was reported on the south side of the Salmon River, Payette National Forest, and reports from aerial surveys indicated especially heavy pine butterfly flights from Warm Springs Creek to Studebaker Saddle on the Main Salmon River (Knopf 1973) (Fig. 6). Evaluation showed high egg deposition at the latter site, leading to predictions of heavy 1972 defoliation for that area (Valcarce 1972). Although this may have been a localized spot, unrepresentative of the



SALMON NATIONAL FOREST

SCALE
0 2 4 6 8 10 MILES

Fig. 5.
REFERENCE POINTS FOR PINE BUTTERFLY
1957-1958

area, it is also possible that the butterflies had migrated from the heavily-defoliated areas less than a mile across the river (Knopf 1971).

Egg mass sampling was also done on the Boise National Forest during 1971, when butterfly populations were generally increasing. Results were interpreted as follows:

<u>Eggs/Branch</u>	<u>Predicted Defoliation Intensity</u>
9	Heavy
5-8	Light
2	Endemic.

Rock Creek, on the Lowman Ranger District, Bear Run, on the Idaho City Ranger District, and Scriber Creek, on the Emmett Ranger District, averaged 3.50, 3.60, and 4.90 eggs/branch, respectively (Fig. 7). Hence, moderate defoliation was predicted there in 1972. Other areas demonstrated only very light defoliation, but were expected to intensify in 1972 (Knopf 1971).

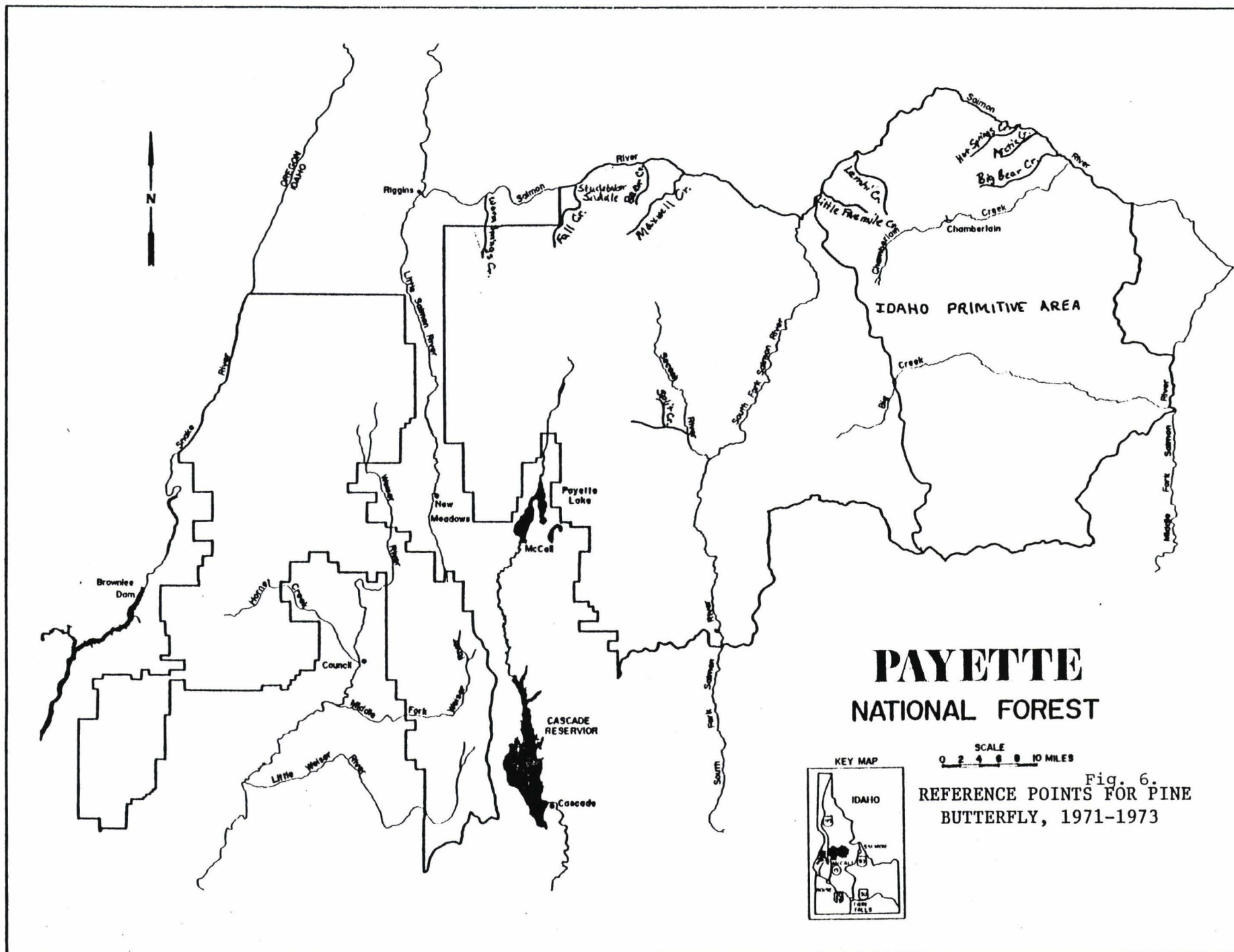
1972

In 1972, defoliation of ponderosa pine by pine butterfly in central Idaho was visible during aerial detection surveys. Populations had been increasing since 1968, and heavier, more extensive defoliation was predicted for 1973 on parts of the Boise and Payette National Forests (Parker 1973b). The aerial detection survey helped identify 20 areas of defoliation on National Forest and Bureau of Land Management lands. Included was forest land south of the Salmon River to land south of Riggins Hot Springs and east to Big Bear Creek in the Idaho Primitive Area (Valcarce 1972) (Fig. 6). The Payette National Forest had 4,400 acres of heavy defoliation over twelve of the twenty detected areas and 2,400 acres of moderate defoliation on all or part of 6 of the 20 areas on the McCall Ranger District (Parker 1973a, 1973b, Valcarce 1972). Heavy defoliation was evident in the Studebaker Saddle area. Visible defoliation outside the Idaho Primitive Area existed on Warm Springs, Bear, Maxwell, and Rooster Creeks; within the Primitive Area, defoliation could be seen around Little Fivemile, Lemhi, Hot Springs, Arctic, and Big Bear Creeks (Valcarce 1972). The Boise National Forest experienced light defoliation which could only be detected by ground surveys (Parker 1973a).

A Boise National Forest egg mass survey in September and October, 1972, showed greatest deposition at Bear Wallow Point, Harris Creek Summit, and Cow Creek (Fig. 7). Predators were most active at Cow Creek, leaving the other two spots with the greatest potential for butterfly buildup (Valcarce 1973). The egg mass survey considered both the number of eggs and the potential for natural control. On the Payette National Forest, Fall Creek exhibited the greatest number of eggs per twig and the third greatest loss from predation (11% egg loss). Studebaker Saddle had the second largest number of eggs per twig and the greatest predation (30% egg loss). These two areas were expected to experience moderate to heavy defoliation in 1973. Split Creek had low numbers of eggs per twig and the second highest predation (21%); it was expected to have little or no visible defoliation in 1973 (Valcarce 1972).

1973

The major populations persisted along the Salmon River on the Payette National Forest and adjacent Bureau of Land Management, State, and private lands, and at Harris Creek Summit Boise National Forest (Knopf 1973). Infestations on the south side of the Salmon River peaked, covering more than 8,000 acres



(Anonymous 1974). Those Payette National Forest lands heavily defoliated in 1972 still exhibited severe defoliation in 1973, but there was no bark beetle buildup. No mortality was suffered; however, some stands had lost all their old needles and some or all of the new needles (Parker 1973b).

A fall egg mass survey on the Payette National Forest indicated that the numbers of viable eggs were drastically reduced. Collection points visited on the Boise National Forest also indicated only light to moderate defoliation predicted for 1974.

Ground surveys indicated about 20 acres heavily infested near Harris Creek Summit on the Boise National Forest. Extremely high numbers of adults were seen ovipositing near Centerville, Idaho making this a new infestation center. An egg mass survey in that area indicated heavy defoliation potential for 1974. Most pine butterfly populations on the Boise National Forest leveled off, however, and the number of egg masses in 1973 was far less than that of 1972 (Parker 1973b).

A pupal parasite survey was conducted in the Fall Creek area on the Payette National Forest. Of the 453 pupae reared, 415 (92%) yielded parasites (wasps and flies) and only 38 (8%) emerged as pine butterflies. This contributed further to the prediction of lower 1974 populations (Anonymous 1973).

1974

Populations did indeed decline as predicted in 1973. The butterfly was a lesser nuisance along the Salmon River than had been anticipated (Anonymous 1974). Defoliation was not observed from either air or ground surveys on the Payette National Forest. There was good 1974 growth with no eggs found (Valcarce 1974). In 1975, several reports of "conspicuous flights" were received from the Boise and Idaho City Ranger Districts on the Boise National Forest. No defoliation was detected by aerial survey, however, and activity was low in other areas (Anonymous 1975, Valcarce 1975).

1981

In late summer widespread butterfly flights occurred on the Boise and Payette National Forests especially along the North Fork of the Payette River. Defoliation was noted over 500 to 600 acres during ground surveys around Dry Buck Summit on the Emmett Ranger District, Boise National Forest (Thier 1982).

An egg mass survey was instituted to predict future defoliation. Fifteen sites were evaluated in areas supporting prior pine butterfly outbreaks. Although viable eggs were found at the majority of these sites moderate defoliation was only expected at Cow Creek, Dry Buck Summit and the North Fork of Rabbit Creek on the Boise National Forest (Thier 1982).

1982

Again adult butterflies were observed in many ponderosa pine stands on the Boise and Payette National Forests but additionally; flights were observed on the Salmon National Forest. Moderate to severe defoliation was recorded over 5,800 acres during aerial detection surveys on and around the Boise National Forest. More extensive defoliation was noted around Dry Buck Summit and a newly defoliated area was noted on private lands around Arling Hot Spring northeast of Cascade, Idaho (Thier and Hoffman 1982, Thier 1983).

Egg surveys in 1982 were expanded to 20 sites including the Boise, Payette, and Salmon National Forests. Viable eggs were gathered at 17 of these sites with moderate to heavy defoliation expected at Arling Hot Spring and Dry Buck Summit, on and around the Boise National Forest. Light defoliation was anticipated around Little Pearsol Creek and North Fork of Rabbit Creek on the Boise National Forest (Thier 1983).

A parasite evaluation at Dry Buck Summit found that natural controls, chiefly T. atalantae fulvescens, was exerting regulatory pressure on the pine butterfly population. Approximately 64 percent of the sampled pine butterfly pupae were parasitized by this wasp. Because of this parasitism rate the infestation at Dry Buck Summit was expected to soon decline (Thier 1983).

1983

Pine butterfly defoliated 16,200 acres of ponderosa pine on and around the Boise, and Payette National Forests as noted during aerial detection surveys. Additionally, ground surveys delineated approximately 80 acres of defoliation in the Owl Creek drainage on the Salmon National Forest (Holland and Tkacz 1984).

Activity was again concentrated in the Dry Buck Summit area on the Emmett Ranger District and largely on State and private lands east of Cascade Reservoir. Defoliation ranged from light to heavy (Thier et al. 1984).

Pine butterfly eggs were gathered at 38 of 43 evaluation sites. The highest egg counts were made on or around the Boise National Forest east of Cascade Reservoir. Dramatic decreases in egg deposition occurred at Arling Hot Spring and Dry Buck Summit. Increases in egg deposition occurred at Lick Creek and Little Pearsol Creek on the Boise National Forest and Colson Creek on the Salmon National Forest. Moderate defoliation was again expected the following year around Dry Buck Summit and the area east of Cascade Reservoir. (Thier et al. 1984).

1984

Pine butterfly defoliation and populations decreased resulting in light to moderate ponderosa pine defoliation over 2,800 acres around the Boise National Forest. Defoliation was not reported on the Salmon National Forest or Dry Buck Summit on the Boise National Forest (Mocettini and Thier 1985).

Egg surveys indicated a general population decline. Light defoliation was the most severe predicted defoliation intensity for 1985 at Pearsol Creek and Scriber Creek. A further decline was predicted for 1986 (Mocettini and Thier 1985).

A pupal parasite survey conducted in two areas east of Cascade Reservoir on the Boise National Forest again found T. atalantae parasitizing pine butterfly. Percent parasitism was approximately 59% at one site and 86% at another.

SUPPRESSION EFFORTS

1922

A proposal to spray foliage with a stomach poison for pine butterfly was rejected. While the eastern United States had been using aerial dusting methods, the economics of initiating such a project in Idaho were unknown. Attempting a project with equipment then available would have been extremely costly for the widespread infestation. Where individual trees were important, such as in small parks or woodlots, spraying with arsenic was recommended (Evenden 1922a, 1922b).

1953

The upward trend of the pine butterfly populations in 1952 alerted forest resource managers to the possible need for a spray project in 1953. A 400-acre block in the Beaver Creek timber sale area, Boise National Forest, was selected for a summer experimental chemical test. The fall egg survey had shown 40-50 eggs per twig which would result in heavy defoliation after hatching (Orr 1953b). Since much of the defoliation occurs in the last 7-10 days of the larval stage, plans were made to spray 2-3 weeks before pupation. Eggs were expected to hatch between the 1st and 20th of June, depending on weather, indicating the need to spray sometime after July 1. Costs of \$1.30/acre were initially anticipated. It was planned to spray 400 gallons of DDT in oil (1.00 lb. DDT in a gallon of #2 fuel oil, costing about \$.30/gallon) with a Ford Tri-Motor airplane (Anonymous 1953a). The test was conducted in conjunction with a western spruce budworm (Choristoneura occidentalis Freeman) spray project on the Nezperce National Forest. The western spruce budworm project provided the chemical, and a plane equipped for that project was hired from Johnson Flying Service, Missoula, Montana (Olsen 1953c). By designating spray headquarters at Grangeville, Idaho, the project was to cost about \$900 (Olsen 1953b). After spraying on July 18, 1953, costs were found to be \$1.50/acre. The excellent results against both pine butterfly and western spruce budworm led to a larger scale treatment in 1954 (Olsen 1953c, 1953d).

On September 9, 1953, representatives of various land managing and protective agencies met with members of the lumber industry to discuss a cooperative effort. This group agreed to work with the Forest Service and the Bureau of Entomology and Plant Quarantine, to conduct an extensive pine butterfly survey and develop a control program. Determining the extent and locations of butterfly populations was a common goal; the Forest Service accepted the assistance, and the Southern Idaho Forest Pest Action Council was formed. The Southern Idaho Forest Pest Action Council evolved into the present Intermountain Forest Stand Management Council organization. It was agreed that participants would provide people and equipment for an egg mass survey in September and October. The Bureau of Entomology and Plant Quarantine would furnish as much technical supervision, equipment, and personnel as it could afford, as well as conduct the aerial survey. Organizations participating in the Council included (Robb 1953):

State of Idaho Department of Forestry
 State of Idaho Land Department
 Keep Idaho Green Committee
 Southern Idaho Timber Protective Association
 Western Pine Association
 Timber Industry members:
 Boise Payette Lumber Co. (Boise)
 McGregor Logging Co. (Boise)
 Morrison Lumber Co. (Meridian)
 Harris Bros. Lumber Co. (Boise)
 Caldwell Box Co. (Horseshoe Bend)
 Price Valley Lumber Co. (Tamarack)
 Portable Lumber Co. (Crouch)

A summary of the pine butterfly infestation on the Boise National Forest was made in the autumn of 1953 as follows (Anonymous 1954b):

South Fork Payette -- Clear Creek	36,000 acres	*+
Deadwood River	21,000	*+
Pine Creek	4,000	
Beaver Creek -- Swanholm	108,000	+
TOTAL	169,000 acres	

* indicates presence of needle cast disease in this area
 (note: only on upper South Fork of the Payette River)
 + indicates presence of spruce budworm in this area

Of these 169,000 acres, 164,931 acres were on the Boise National Forest (97.6% of the total). Another 2,560 acres (1.5%) were on the State of Idaho, and 1,509 acres (0.9%) were on private lands. Stumpage value of the 169,000 acres of ponderosa pine was estimated at \$33,040,000 (Anonymous 1953d).

1954

An access road plan was proposed in 1954 and \$9.5 million was requested to access and log areas infested or threatened by pine butterfly, western spruce budworm, bark beetles, and needle cast disease (Anonymous 1954b).

Spray plans using the insecticide, DDT, in 1954 were given high priority and initiated. Since it was desired to spray during the early instars when larvae were small and clustered, project entomologists watched development at different locations to prioritize treatment. Warm spring weather brought forth the new larvae sooner than expected; hatching occurred around May 20. Spraying began on June 7, rather than the scheduled June 10 (Anonymous 1954a).

A total of \$220,000 to spray pine butterfly had been received through the Forest Pest Control Act (McArdle 1953). Since most of the area to be sprayed was federally owned, it was decided that State and private sectors should not contribute to the spray project.

Costs for spraying the 169,000 acres had been estimated at \$245,250 (Anonymous 1953d).

The treatment area was divided into two spray units, one operating from an airstrip near Idaho City and the other from a strip near Warm Spring. The former encompassed the Boise River watershed; this unit, consisted of 26 spray blocks. The second unit covered the Payette River watershed in 14 spray blocks. Each spray block contained 1000-1400 acres grouped according to topography, roads, creeks, and other features usable for guiding pilots (Anonymous 1954a). Areas recommended by the entomologists for treatment had been checked and confirmed by federal, state, and private foresters. Spraying on the Warm Springs unit began June 7 and ended July 7. Bad weather delayed insect development and postponed treatments on the Idaho City unit until mid-June; this unit was completed on July 2 (Anonymous 1954a, Olsen 1954).

A total of 244,587 gallons of insecticide was sprayed over 255,403 acres at a cost of \$0.88/acre, significantly less than the estimated cost of \$1.45/acre (Anderson 1954). The entire project required 316 airplane hours and 1,358 man-days (Anderson 1954).

Results of the spray project were excellent; both units experienced approximately 99% reduction of pine butterfly larvae (Olsen 1954).

SUMMARY

Outbreaks of pine butterfly have been recorded repeatedly following discovery of the white butterfly in 1868. Several outbreaks were the focus of suppression efforts. Doubtless, future outbreaks will occur and suppression will again be considered.

This document lends perspective to the importance of pine butterfly and will be useful when land managers plan forest resource activities.

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